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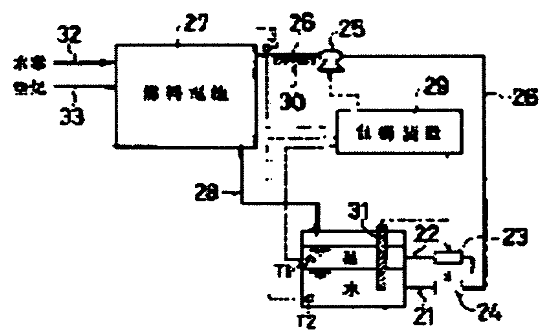
(54) SOLID POLYMER TYPE FUEL CELL SYSTEM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a simple and small solid polymer type fuel cell system in which cell stack temperature is surely raised to an adequate temperature, and freezing of water in the solid polymer type fuel cell stack, in piping, in circulation pump, or the like is prevented.
SOLUTION: The solid polymer type fuel cell system comprises a gas flow path for supplying fuel gas and oxidizing gas to a cell stack in which a plurality of cell units are stacked, and a cooling path that communicates water or a hydrophobic oil having a boiling point of 100° C or Irigher, wherein switching means that switches water or the hydrophobic oil as a liquid supplied to the cooling path and a heating means that heats water or the hydrophobic oil to an adequate temperature are provided. At stopping, the water in the cooling path is switched to the hydrophobic oil. At starting, the hydrophobic oil whose temperature rises is supplied to the cooling path or the like to rapidly heat the fuel cell.



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CLAIMS

[Claim(s)]
[Claim 1] The polymer electrolyte fuel cell system characterized by to have the change means which is the polymer electrolyte fuel cell system by which the cell stack which carried out two or more laminatings of the cel unit was equipped with the gas passageway for fuel gas and oxidant-gas supply, and the cooling path where the hydrophobic oil which has water or the boiling point 100 degrees C or more circulates, and changes the liquid supplied to said cooling path to water or said hydrophobic oil, and a heating means for heating water and said hydrophobic oil to optimal temperature.
[Claim 2] The polymer electrolyte fuel cell system according to claim 1 characterized by storing water and said hydrophobic oil in one storage tank.
[Claim 3] The polymer electrolyte fuel cell system according to claim 2 by which the output port of the liquid which makes water a subject is characterized by preparing at least one or more output port each of the liquid which makes said hydrophobic oil a subject caudad of said storage tank above said storage tank.
[Claim 4] Claim 2 characterized by equipping said storage tank with the heating means for heating water and said hydrophobic oil, or a polymer electrolyte fuel cell system according to claim 3.
[Claim 5] The polymer electrolyte fuel cell system according to claim 1 characterized by storing water and said hydrophobic oil in the respectively different storage tank.
[Claim 6] The polymer electrolyte fuel cell system according to claim 5 characterized by equipping said storage tank with the heating means for heating water and said hydrophobic oil.
[Claim 7] A polymer electrolyte fuel cell system given in either of claim 1 to claims 6 characterized by said hydrophobic oils being the engine oil for automobiles, a mineral lubricating oil, synthetic lubricating oils, or such two mixture or more.
[Claim 8] A polymer electrolyte fuel cell system given in either of claim 2 to claims 6 characterized by carrying out the completion of a halt after changing the water in a cooling path to said hydrophobic oil at the time of a fuel cell halt and returning the water in a cooling path to said storage tank.
[Claim 9] The polymer electrolyte fuel cell system according to claim 8 characterized by carrying out the completion of a halt after changing the water in a cooling path to said hydrophobic oil at the time of a fuel cell halt and returning the water in a cooling path to said storage tank when there is a possibility that a means to detect outside air temperature may be established, the detected outside air temperature may be low and water may be frozen.
[Claim 10] A polymer electrolyte fuel cell system given in either of claim 2 to claims 9 characterized by starting the temperature up of said hydrophobic oil when there is a possibility that a means to detect the temperature of the water in said storage tank at the time of fuel cell starting may be established, the detected water temperature may be low and water may be frozen.
[Claim 11] A polymer electrolyte fuel cell system given in either of claim 1 to claims 10 characterized by changing said hydrophobic oil to water after a possibility that a means to detect the temperature of a fuel cell at the time of fuel cell starting may be established, the temperature of the fuel cell which supplied and detected said hydrophobic oil to said cooling path may become high, and water may be frozen disappears.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a polymer electrolyte fuel cell system.
[0002]
[Description of the Prior Art] Drawing 3 is the decomposition sectional view showing the basic configuration of the cel unit of the polymer electrolyte fuel cell which is one gestalt of the conventional fuel cell. The air pole side catalyst bed 2 which contains noble metals (mainly platinum) in the principal plane of the both sides of the solid-state polyelectrolyte film 1, respectively, and the fuel electrode side catalyst bed 3 are joined, and a cel is constituted. It counters with the air pole side catalyst bed 2 and the fuel electrode side catalyst bed 3, and the air pole side gaseous diffusion layer 4 and the fuel electrode side gaseous diffusion layer 5 are arranged, respectively. Thereby, an air pole 6 and a fuel electrode 7 are constituted, respectively. These gaseous diffusion layers 4 and 5 serve to tell a current outside at the same time they pass oxidant gas and fuel gas, respectively. And it pinches with the separator 10 of a lot which consists of a conductive and gas impermeable ingredient which faced the cel, was equipped with the gas passageway 8 for reactant gas supply, and equipped the principal plane which faces with the cooling path 9 for cooling water circulation, and the cel unit 11 is constituted.
[0003] Drawing 4 is the sectional view showing the basic configuration of a polymer electrolyte fuel cell stack. The laminating of many cel units 11 is carried out, and it pinches by the clamping plate 14 for adding a collecting electrode plate 12, the electric insulating plate 13 aiming at electric insulation and heat insulation, and a load, and holding a laminating condition, and is bound tight with the bolt 15 and the nut 17, and the bolting load is added with the pan spring 16.
[0004] The oxidant gas sent to the fuel gas sent to the separator 10 which faced the fuel electrode 7, or the separator 10 which faced the air pole 6 is shunted toward many gas passagewaies 8, respectively, is diffused to an electrode, and contributes to electrochemical reaction. That is, if the fuel gas which contains hydrogen in a fuel electrode 7 through a gas passageway 8, and the oxidant gas which contains oxygen in an air pole 6 are supplied, with a fuel electrode 7, a generation of electrical energy will be performed by the following electrochemical reaction which generates water from oxygen, a hydrogen ion, and an electron by the fuel electrode reaction which decomposes a hydrogen content child into a hydrogen ion and an electron, and the air pole 6.
[0005] fuel electrode; -- H2 ->2H++2e-air pole; -- the 2H++(1/2) O2+2e-->H2 O whole ; H2+(1/2) O2 ->H2 O [0006] as fuel gas -- hydrocarbon system fuel gas, such as town gas, -- a reforming machine -- reforming -- hydrogen -- although what was made into rich gas may be used, a minute amount usually carbon monoxide is contained in this reforming fuel gas. When the fuel gas with which a minute amount carbon monoxide is contained was supplied to the fuel cell, rather than temperature (about 60-100 degrees C) with a proper polymer electrolyte fuel cell stack, the catalyst (mainly platinum) of the catalyst bed 3 by the side of a fuel electrode 7 carried out CO poisoning to it being low temperature especially, and there was a possibility that the cell engine performance might deteriorate greatly.
[0007] On the other hand, in order to continue and demonstrate an effective generation-of-electrical-energy function, it is necessary to supply the water for cooling to the cooling path 9 of each separator 10, to cool an air pole 6 and a fuel electrode 7, and to maintain a polymer electrolyte fuel cell stack to proper temperature (about 60-100 degrees C). For this reason, at the time of starting of a polymer electrolyte fuel cell, carrying out the temperature up of the cell stack temperature to proper temperature certainly was called for.
[0008] Usually, the temperature up of a cell stack heats the water for cooling using a suitable heating means, and is performed by supplying a cell stack. However, when using a polymer electrolyte fuel cell stack in a cold district, the water for cooling was frozen with the circulating pump etc. in the interior of a polymer electrolyte fuel cell stack, and piping, and there was a temperature up's becoming impossible and a problem of occasionally damaging these.
[0009]
[Problem(s) to be Solved by the Invention] JP,8-78033,A is equipped with a heat carrier tank in order to control the temperature of a fuel cell stack, and at the time of fuel cell starting, the approach of carrying out the temperature up of the temperature of a fuel cell promptly with the heat carrier which heated and heated the heat carrier at the heating heater of this heat carrier tank is indicated. However, even if this approach could carry out the temperature up of the temperature of a fuel cell at the time of fuel cell starting, the problem which cooling water freezes within a fuel cell etc. in a cold district etc. still remained, and when cooling water was frozen before fuel cell starting, it needed to be thawed.
[0010] The 1st cooling path where the water as the 1st cooling medium for cooling an anode lateral electrode is introduced into JP,10-55812,A, The ethanol as the 2nd cooling medium for cooling a cathode lateral electrode, The fuel cell which has the two refrigerant circulatory system with the 2nd cooling path where ethylene glycol etc. is introduced is indicated. When a freezing detection means to detect freezing of water to the cooling circulatory system is established and freezing of water is detected, introducing and thawing the 2nd heated cooling medium to the 2nd cooling path of a cathode lateral electrode is indicated. However, this fuel cell had the problem which the whole system, such as need, complicates and extension of the pump for cooling intermediation general circulation enlarges, when freezing of the water in the interior etc. was not able to be prevented.
[0011] As mentioned above, at the time of starting of a polymer electrolyte fuel cell, it is required to carry out the temperature up of the cell stack temperature to proper temperature certainly. Conventionally, water is used as a cooling medium. However, in a cold district, the problem which water freezes in a polymer electrolyte fuel cell stack and a cooling path arises at the time of shutdown. Therefore, it is required to be able to operate and generate a cell stack by the proper service condition, without performing the temperature up at the time of starting promptly to the bottom of an environment with a possibility that water may be frozen, being able to prevent freezing of the water at the time of a halt completely, and causing enlargement of a system. The purpose of this invention solves the conventional above-mentioned problem, is a simple configuration, and is offering the polymer electrolyte fuel cell system

which can carry out the temperature up of the cell stack temperature to proper temperature promptly also in a cold district etc.
[0012]
[Means for Solving the Problem] Namely, the polymer electrolyte fuel cell system of this invention for solving the conventional problem according to claim 1 The gas passageway for fuel gas and oxidant gas supply to the cell stack which carried out two or more laminatings of the cel unit, The change means which is the polymer electrolyte fuel cell system by which it had the cooling path where the hydrophobic oil which has water or the boiling point 100 degrees C or more circulates, and changes the liquid supplied to said cooling path to water or said hydrophobic oil, It is characterized by having a heating means for heating water and said hydrophobic oil to optimal temperature.
[0013] The polymer electrolyte fuel cell system of this invention according to claim 2 is characterized by storing water and said hydrophobic oil in one storage tank in a polymer electrolyte fuel cell system according to claim 1.
[0014] The output port of the liquid with which the polymer electrolyte fuel cell system of this invention according to claim 3 makes water a subject in a polymer electrolyte fuel cell system according to claim 2 is characterized by preparing at least one or more output port each of the liquid which makes said hydrophobic oil a subject caudad of said storage tank above said storage tank.
[0015] The polymer electrolyte fuel cell system of this invention according to claim 4 is characterized by equipping said storage tank with the heating means for heating water and said hydrophobic oil in claim 2 or a polymer electrolyte fuel cell system according to claim 3.
[0016] The polymer electrolyte fuel cell system of this invention according to claim 5 is characterized by storing water and said hydrophobic oil in the respectively different storage tank in a polymer electrolyte fuel cell system according to claim 1.
[0017] The polymer electrolyte fuel cell system of this invention according to claim 6 is characterized by equipping said storage tank with the heating means for heating water and said hydrophobic oil in a polymer electrolyte fuel cell system according to claim 5.
[0018] The polymer electrolyte fuel cell system of this invention according to claim 7 is characterized by said hydrophobic oils being the engine oil for automobiles, a mineral lubricating oil, synthetic lubricating oils, or such two mixture or more in a polymer electrolyte fuel cell system given in either of claim 1 to claims 6.
[0019] In a polymer electrolyte fuel cell system given in either of claim 2 to claims 6, after the polymer electrolyte fuel cell system of this invention according to claim 8 changes the water in a cooling path to said hydrophobic oil at the time of a fuel cell halt and returns the water in a cooling path to said storage tank, it is characterized by carrying out the completion of a halt.
[0020] The polymer electrolyte fuel cell system of this invention according to claim 9 establishes a means to detect outside air temperature in a polymer electrolyte fuel cell system according to claim 8, and when there is a possibility that the detected outside air temperature may be low and water may be frozen, after it changes the water in a cooling path to said hydrophobic oil at the time of a fuel cell halt and returns the water in a cooling path to said storage tank, it is characterized by carrying out the completion of a halt.
[0021] The polymer electrolyte fuel cell system of this invention according to claim 10 is characterized by starting the temperature up of said hydrophobic oil, when there is a possibility that a means to detect the temperature of the water in said storage tank in a polymer electrolyte fuel cell system given in either of claim 2 to claims 9 at the time of fuel cell starting may be established, the detected water temperature may be low and water may be frozen.
[0022] The polymer electrolyte fuel cell system of this invention according to claim 11 is characterized by changing said hydrophobic oil to water, after a possibility that a means to detect the temperature of a fuel cell in a polymer electrolyte fuel cell system given in either of claim 1 to claims 10 at the time of fuel cell starting may be established, the temperature of the fuel cell which supplied and detected said hydrophobic oil to said cooling path may become high, and water may be frozen disappears.
[0023] For example, at the time of a fuel cell halt, the polymer electrolyte fuel cell system of this invention The inside of a cooling path, The liquids in piping for liquid circulation and a circulating pump etc. are changed to a hydrophobic oil. Since water is supplied all over this cooling path after making it stop after returning water to a storage tank, supplying the hydrophobic oil which carried out the temperature up at the time of fuel cell starting all over this cooling path, heating a fuel cell quickly and abolishing fear of freezing of water When the temperature up of the cell stack temperature can be certainly carried out to proper temperature, a configuration is simple and can prevent freezing of water, such as a circulating pump, in the **** which can be miniaturized, the interior of a fuel cell stack, and piping. In case it controls fuel cell stack temperature, in the case of small amount of water, distribution (specific heat large effectiveness) is acquired whenever [good cell internal temperature], and since the specific heat is large and viscosity is low compared with a hydrophobic oil, since water has the effectiveness which can also control power consumption of a circulating pump (hypoviscosity), it is excellent [water] in the temperature control nature of a fuel cell. The hydrophobic oil is suitable for using it especially for the temperature up in a cold district to it from having the part with the small specific heat, and the description of being easy to become hot.
[0024]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail using a drawing. Drawing 1 is an explanatory view explaining one embodiment of the polymer electrolyte fuel cell system of this invention by which water and a hydrophobic oil are stored in one storage tank, and drawing 2 is an explanatory view explaining one embodiment of other polymer electrolyte fuel cell systems of this invention by which water and a hydrophobic oil are stored in the respectively different storage tank.
[0025] In drawing 1 , water and a hydrophobic oil (it was indicated as the oil in drawing 1 as an example) are stored in one storage tank 20 in the polymer electrolyte fuel cell system of this invention. Since the specific gravity of the hydrophobic oil used in this embodiment is smaller than the specific gravity of water, a hydrophobic oil is located above a storage tank 20, and water is located caudad. And one output port 22 each of the liquid (a hydrophobic oil is called below) with which the output port 21 of the liquid (water is called below) which makes water a subject under the storage tank 20 makes a hydrophobic oil a subject above a storage tank 20 is formed. Output port 21 and 22 is connected with the liquid circulation path 26 equipped with the circulating pump 25 through the change valves 23 and 24, respectively, water or a hydrophobic oil is supplied to the cooling path 9 which a fuel cell 27 does not illustrate, and the return cyclic use of waste water of it is carried out to a storage tank 20 through the liquid circulation path 28 after heat exchange.
[0026] With the detection means which 29 is a control unit and is not illustrated, the temperature of a fuel cell 27 (for example, temperature of the cel unit 11), The signal which detects the temperature T1 of the oil in a storage tank 20 and the temperature T2 of water, outside air temperature, etc., and opens either the change valve 23 or the change valve 24 in response to the signal is taken out. While opening the change valve 23 or either of 24, a signal is sent and operated to a circulating pump 25. The cooling path 9 where a fuel cell 27 does not illustrate water or a hydrophobic oil through the liquid circulation path 26 is supplied, and it returns to a storage tank 20 through the liquid circulation path 28 after heat exchange. T1 is the thermometric element of the oil installed above the storage tank 20, it detects the temperature of an oil, controls the heater 31 in the delivery storage tank 20 for the signal to a control unit 29, and controls the temperature of an oil. T2 is the thermometric element of the water installed under the storage tank 20, it detects the

temperature of water, controls the heater 31 in the delivery storage tank 20 for the signal to a control unit 29, and controls the temperature of water. T3 is the thermometric element of the circulation liquid installed in the liquid circulation duct 26 between a fuel cell 27 and a circulating pump 25, and controls the temperature of the hydrophobic oil which controls the heater 30 which installed the signal in the liquid circulation duct 26 between delivery, a fuel cell 27, and a circulating pump 25 to the control unit 29, and goes into a fuel cell 27, and water. 32 shows a fuel gas supply way and 33 shows an oxidant gas supply way.

[0027] The fuel gas which contains hydrogen in a fuel electrode 7 through the gas passageway 8 which is not illustrated from the fuel gas supply way 32 to the fuel cell 27 shown in drawing 1 is supplied. While supplying and generating the oxidant gas (air) which contains oxygen in an air pole 6 through the gas passageway 8 which is not illustrated from the oxidant gas supply way 33 The water controlled by the predetermined temperature in a storage tank 20 at the cooling path 9 of each separator 10 which is not illustrated during a generation of electrical energy in a fuel cell 27 is taken out from output port 21. A fuel cell 27 is supplied through the change valve 24, the liquid circuit 26, and a circulating pump 25, an air pole 6 and a fuel electrode 7 are cooled, and a polymer electrolyte fuel cell stack is maintained to proper temperature (about 80-100 degrees C). The water supplied to the fuel cell 27 is returned to a storage tank 20 through the liquid circulation path 28 after heat exchange.

[0028] And in stopping a fuel cell 27, change from a control unit 29 and it takes out a signal to a valve 24. While shutting the change valve 24, change from a control unit 29 and a signal is taken out to a valve 23. Open the change valve 23, take out the hydrophobic oil in a storage tank 20 from output port 22, and a fuel cell 27 is supplied through the change valve 23, the liquid circuit 26, and a circulating pump 25. The water in the water in the cooling path 9 which is not illustrated, the change valves 23 and 24, the liquid circuit 26, and a circulating pump 25 is changed to a hydrophobic oil, and after returning the water in the cooling path 9 etc. to a storage tank 20, the completion of a halt is carried out. If it does in this way, the problem which the water of the cooling path 9, the change valves 23 and 24, the liquid circuit 26, and a circulating pump 25 freezes in a polymer electrolyte fuel cell 27 also in a metaphor cold district at the time of shutdown is avoidable.

[0029] And the hydrophobic oil which carried out the temperature up of the hydrophobic oil to predetermined temperature at heaters 30 and 31, and carried out the temperature up at the time of fuel cell 27 starting is taken out from the output port 22 of a storage tank 20, the change valve 23, the liquid circuit 26, and the cooling path 9 that a fuel cell 27 does not illustrate through a circulating pump 25 are supplied, the temperature up of the fuel cell 27 is carried out, and the temperature up of the temperature of a fuel cell 27 is carried out to proper temperature (about 80).

[0030] After carrying out the temperature up of the temperature of a fuel cell 27 to proper temperature (about 80) and abolishing fear of freezing of water, change from a control unit 29 and a signal is taken out to a valve 24. While opening the change valve 24, change from a control unit 29 and a signal is taken out to a valve 23. Shut the change valve 23, take out the water of the predetermined temperature in a storage tank 20 from output port 21, and the change valve 24, the liquid circuit 26, and each cooling path 9 that a fuel cell 27 does not illustrate through a circulating pump 25 are supplied. An air pole 6 and a fuel electrode 7 are cooled, and a polymer electrolyte fuel cell stack is maintained to proper temperature (about 80 degrees C). In case it controls fuel cell stack temperature, in the case of small amount of water, distribution (specific heat large effectiveness) is acquired whenever [good cell internal temperature], and since the specific heat is large and viscosity is low compared with a hydrophobic oil, since water has the effectiveness which can also control power consumption of a circulating pump 25 (hypoviscosity), it is excellent [water] in the temperature control nature of a fuel cell 27. The hydrophobic oil is suitable for using it especially for the temperature up of the fuel cell 27 in a cold district to it from having the part with the small specific heat, and the description of being easy to become hot.

[0031] When there is a possibility that a means to detect the outside air temperature which is not illustrated as mentioned above may be established, the detected outside air temperature may be low and water may be frozen, it sets at the time of fuel cell 27 halt. If it is made to carry out the completion of a halt after changing water, such as water in the cooling path 9 which is not illustrated, the change valves 23 and 24, the liquid circuit 26, and a circulating pump 25, to a hydrophobic oil and returning the water in the cooling path 9 etc. to a storage tank 20 Freezing of the water in the interior of a fuel cell 27, the change valves 23 and 24, the liquid circuit 26, a circulating pump 25, etc. can be prevented more certainly.

[0032] A means (T2) to detect the temperature of the water in a storage tank 20 as mentioned above is established, and if the temperature up of a hydrophobic oil is started when there is a possibility that the water temperature detected at the time of fuel cell 27 starting may be low, and water may be frozen, when freezing of the water inside a fuel cell 27 etc. can be prevented more certainly, the temperature up of the fuel cell 27 can be promptly carried out to appropriate temperature.

[0033] When freezing of the water inside a fuel cell 27 etc. can prevent more certainly if a hydrophobic oil is changed to water after a possibility that a means detect the temperature of the fuel cell 27 which is not illustrated as mentioned above is established, a hydrophobic oil may be supplied to the cooling path 9 which is not illustrated at the time of fuel cell 27 starting, the temperature of the detected fuel cell 27 may become high, and water may be frozen disappears, the temperature up of the fuel cell 27 can carry out to appropriate temperature promptly.

[0034] Drawing 2 is an explanatory view explaining one embodiment of other polymer electrolyte fuel cell systems of this invention by which water and a hydrophobic oil are stored in the respectively different storage tank. In addition, the duplicate explanation is omitted by giving the same reference mark to the same component as the component shown in drawing 1 in drawing 2 . Store and use a hydrophobic oil for storage tank 20A, and a hydrophobic oil is taken out from the output port 22 of storage tank 20A. After supplying the change valve 23, the liquid circuit 26, and the cooling path 9 that a fuel cell 27 does not illustrate through a circulating pump 25 and carrying out heat exchange, The cyclic use of waste water is returned and carried out to storage tank 20A through liquid circulation path 28A equipped with the change valve 34. Store and use water for storage tank 20B, and water is taken out from the output port 21 of storage tank 20B. After supplying the change valve 24, the liquid circuit 26, and the cooling path 9 that a fuel cell 27 does not illustrate through a circulating pump 25 and carrying out heat exchange, it returns to storage tank 20B through liquid circulation path 28B equipped with the change valve 35, and is made to carry out the cyclic use of waste water. And when changing the hydrophobic oil of the cooling path 9 which the change valve 24, the liquid circuit 26, a circulating pump 25, and a fuel cell 27 do not illustrate to water The signal from the level upper limit detection sensor 37 installed in the upper part of storage tank 20A so that the level upper limit of delivery storage tank 20A may not be exceeded to a control device 29 It is the same as that of the polymer electrolyte fuel cell system of this invention shown in drawing 1 except having put the water which was installed in the lower part of storage tank 20A and which changed, carried out closing motion control of the valve 36, and collected on the lower part of storage tank 20A into storage tank 20B, carrying out. When the polymer electrolyte fuel cell system of this invention shown in drawing 2 does so the same operation effectiveness as the polymer electrolyte fuel cell system of this invention shown in drawing 1 , since water and a hydrophobic oil are stored in the respectively different storage tank, it can control that can manage handling separately and both are mixed in water and a hydrophobic oil.

[0035] The polymer electrolyte fuel cell system of this invention shown in drawing 1 and drawing 2 does not have the increment in a liquid circulation path and a circulating pump as compared with the conventional polymer electrolyte fuel cell system. The change of

water and a hydrophobic oil can be easily performed with the change valves 23 and 24. At the time of a fuel cell halt, as mentioned above For example, inside of a cooling path, inside of piping for liquid circulation, It is made to stop, after changing the liquids in a circulating pump etc. to a hydrophobic oil and returning water to a storage tank. Since water is supplied all over this cooling path after supplying the hydrophobic oil which carried out the temperature up at the time of fuel cell starting all over this cooling path, heating a fuel cell quickly and abolishing fear of freezing of water When the temperature up of the cell stack temperature can be certainly carried out to proper temperature, a configuration is simple and can prevent freezing of water, such as a circulating pump, in the **** which can be miniaturized, the interior of a fuel cell stack, and piping.

[0036] The hydrophobic oil used by this invention does not have corrosive to a structural material, and it is nontoxic. There is high thermal stability in an operating temperature, the shape of liquid is maintained also at low temperature (the congealing point is), it is high in the flash point or self-ignition temperature, the vapor pressure in an operating temperature is low, and it is what gives high rate of heat transfer. Since it has the hydrophobicity which is not easily mixed with water and is operated at the temperature whose polymer electrolyte fuel cell stack of this invention it is cheap and is about 60-100 degrees C, if the boiling point is 100 degrees C or more, the thing of the natural product origin The constituent with which synthetic compounds also made these the base and blended the well-known additive is sufficient, and such two or more mixture is especially sufficient, and it is not limited.

[0037] Since a hydrophobic oil is located above a storage tank 20 and water is caudad located if the specific gravity of a hydrophobic oil is smaller than the specific gravity of water when water and a hydrophobic oil are stored in one storage tank 20, as shown in drawing 1 , heating of a hydrophobic oil and a temperature up are easy to carry out and are also desirable the top where storage with a storage tank 20, ejection, etc. are easy. However, the specific gravity of a hydrophobic oil may be larger than the specific gravity of water.

[0038] As a hydrophobic oil used by this invention, specifically A crude oil as a mineral oil system for example, atmospheric distillation and the lubricating oil fraction obtained by carrying out vacuum distillation Solvent deasphalting, solvent extraction, hydrocracking, solvent dewaxing, contact dewaxing, hydrorefining, As oils refined combining suitably purification processing of sulfuric acid treatment, clay treatment, etc., such as paraffin series and a naphthene, and a synthetic oil system The Pori alpha olefin (polybutene, 1-octene oligomer, 1-decene oligomer, etc.), Oils, such as alkylbenzene, alkyl naphthalene, silicone system oil, and fluorine system oil, or an additive (an antioxidant --) well-known to the oil which combined these two or more sorts, or these An extreme pressure agent, a rust preventive, a metal deactivator, metal system detergent, non-ash content powder, a defoaming agent, It is independent, or combine a viscosity index improver, two or more kinds of pour point depressants, etc., add, and are obtained. Gasoline engine oils, such as a gas turbine oil, compressor oil, hydraulic fluid, a lubricating oil, other four-stroke-cycle-engine oils, and two-cycle engine oil; The Diesel engine oil for land, Diesel engine oil, such as Diesel engine oil for ships; An inhibited turbine oil, Turbine oil, such as a marine turbine oil; The gear oil for automobiles, industrial use gear oil, gear oil [, such as an automatic-transmission oil,]; -- vacuum-pump-oil; -- refrigerating-machine-oil; -- rust-resistor oils, such as metalworking fluid; slipping slideway oil (machine tool oil); bearing oils, such as cutting oil, grinding fluid, a plastic-working oil, heat treating oil, and an electron discharge method oil, a heat carrier oil, etc. can be mentioned. These can be used combining independent or two sorts or more. The viscosity of the hydrophobic oil used by this invention is driven with a circulating pump, and is not limited that what is necessary is just to be especially able to use the cooling path of a fuel cell, a liquid circulation path, etc. for a storage tank, circulating and circulating through them.

[0039] Also in these, the engine oil for automobiles, a mineral lubricating oil, synthetic lubricating oils, or such two mixture or more can be preferably used as a hydrophobic oil that acquisition is also easy and cheap, when it has said property as a hydrophobic oil.

[0040] As said additive, specifically For example, amine system antioxidants, such as phenolic antioxidants, such as 2,6-di-t-butyl-p-cresol, and a phenyl-alpha-naphthylamine, Extreme pressure agents, such as tricresyl phosphate, triphenyl phosphate, and dithiophosphate zinc, Rust preventives, such as petroleum sulfonate and dinonyl naphthalene sulfonate, Metal deactivators, such as benzotriazol, tolyl triazole, and mercaptobenzothiazole, Alkaline-earth-metal sulfonate, alkali earth metal phenate, an alkaline-earth-metal SARISHI rate, Metal system detergent, such as alkaline-earth-metal phosphonate, amber acid ester, Viscosity index improvers, such as defoaming agents, such as non-ash content powder, such as benzylamine, and silicone, polymethacrylate, an olefin copolymer, a polyisobutylene, and polystyrene, a pour point depressant, etc. are mentioned.

[0041] In addition, explanation of the above-mentioned operation gestalt is for explaining this invention, limits invention of a publication to a claim, or does not **** the range. Moreover, deformation various by technical within the limits given not only in the above-mentioned example but a claim is possible for each part configuration of this invention.

[0042]

[Effect of the Invention] The polymer electrolyte fuel cell system of this invention according to claim 1 The gas passageway for fuel gas and oxidant gas supply to the cell stack which carried out two or more laminatings of the cel unit, The change means which is the polymer electrolyte fuel cell system by which it had the cooling path where the hydrophobic oil which has water or the boiling point 100 degrees C or more circulates, and changes the liquid supplied to said cooling path to water or said hydrophobic oil, Since it has the heating means for heating water and said hydrophobic oil to optimal temperature For example, at the time of a fuel cell halt, the liquids in a cooling path, in piping for liquid circulation and a circulating pump, etc. are changed to a hydrophobic oil. Since water is supplied all over this cooling path after making it stop after returning water to a storage tank, supplying the hydrophobic oil which carried out the temperature up at the time of fuel cell starting all over this cooling path, heating a fuel cell quickly and abolishing fear of freezing of water When the temperature up of the cell stack temperature can be certainly carried out to proper temperature, a configuration is simple and does so the remarkable effectiveness that freezing of water, such as a circulating pump, can be prevented, in the **** which can be miniaturized, the interior of a fuel cell stack, and piping.

[0043] In a polymer electrolyte fuel cell system according to claim 1, a configuration becomes simpler and the polymer electrolyte fuel cell system of this invention according to claim 2 does so the further remarkable effectiveness [say / that it can miniaturize further], when doing so the same effectiveness as a polymer electrolyte fuel cell system according to claim 1, since water and said hydrophobic oil are stored in one storage tank.

[0044] The polymer electrolyte fuel cell system of this invention according to claim 3 does so the further remarkable effectiveness [say / that each liquid can be easily taken out from each output port when the output port of the liquid of said storage tank which makes said hydrophobic oil a subject caudad does so the same effectiveness as a polymer electrolyte fuel cell system according to claim 2, since one or more output port each of the liquid which makes water a subject is prepared above said storage tank at least] in a polymer electrolyte fuel cell system according to claim 2.

[0045] in claim 2 or a polymer electrolyte fuel cell system according to claim 3, since said storage tank is equipped with the heating means for heating water and said hydrophobic oil, if it can be heated easily, the polymer electrolyte fuel cell system of this invention according to claim 4 controlling water and said hydrophobic oil, it will be obtained, and does the further effectiveness so.

[0046] In a polymer electrolyte fuel cell system according to claim 1, the polymer electrolyte fuel cell system of this invention

according to claim 5 does so the further remarkable effectiveness [say / becoming easy to deal with it, since it can control that said hydrophobic oil is mixed with water], when doing so the same effectiveness as a polymer electrolyte fuel cell system according to claim 1, since water and said hydrophobic oil are stored in the respectively different storage tank.
[0047] in a polymer electrolyte fuel cell system according to claim 5, since said storage tank is equipped with the heating means for heating water and said hydrophobic oil, if it can be heated easily, the polymer electrolyte fuel cell system of this invention according to claim 6 controlling water and said hydrophobic oil, it will be obtained, and does the further effectiveness so.
[0048] Since said hydrophobic oils are the engine oil for automobiles, a mineral lubricating oil, synthetic lubricating oils, or such two mixture or more, when the polymer electrolyte fuel cell system of this invention according to claim 7 does so the same effectiveness as a polymer electrolyte fuel cell system according to claim 1 in a polymer electrolyte fuel cell system given in either of claim 1 to claims 6, these have said property as a hydrophobic oil, and do so the further remarkable effectiveness [say / that acquisition is also easy and being cheap].
[0049] The polymer electrolyte fuel cell system of this invention according to claim 8 Since the completion of a halt is carried out after changing the water in a cooling path to said hydrophobic oil at the time of a fuel cell halt and returning the water in a cooling path to said storage tank in a polymer electrolyte fuel cell system given in either of claim 2 to claims 6 When doing so the same effectiveness as said polymer electrolyte fuel cell system, the further remarkable effectiveness [say / that freezing of the water inside a fuel cell etc. can be prevented more certainly] is done so.
[0050] The polymer electrolyte fuel cell system of this invention according to claim 9 In a polymer electrolyte fuel cell system according to claim 8, establish a means to detect outside air temperature, and when there is a possibility that the detected outside air temperature may be low and water may be frozen, it sets at the time of a fuel cell halt. Since the completion of a halt is carried out after changing the water in a cooling path to said hydrophobic oil and returning the water in a cooling path to said storage tank When doing so the same effectiveness as a polymer electrolyte fuel cell system according to claim 8, the further remarkable effectiveness [say / that freezing of the water within the interior of a fuel cell, a liquid circulation path, and a circulating pump etc. can be more certainly prevented effectively also in winter or a cold district] is done so.
[0051] The polymer electrolyte fuel cell system of this invention according to claim 10 In a polymer electrolyte fuel cell system given in either of claim 2 to claims 9 Since the temperature up of said hydrophobic oil is started when there is a possibility that a means to detect the temperature of the water in said storage tank at the time of fuel cell starting may be established, the detected water temperature may be low and water may be frozen The inside of said storage tank when doing so the same effectiveness as said polymer electrolyte fuel cell system, When freezing of the water the inside of a liquid circulation path, inside a fuel cell, etc. can be prevented effectively certainly, the temperature up of said hydrophobic oil is performed with sufficient timing, and the further remarkable effectiveness [say / that compaction of fuel cell warm-up time can be aimed at] is done so.
[0052] The polymer electrolyte fuel cell system of this invention according to claim 11 In a polymer electrolyte fuel cell system given in either of claim 1 to claims 10 Since said hydrophobic oil is changed to water after a possibility that a means to detect the temperature of a fuel cell at the time of fuel cell starting may be established, the temperature of the fuel cell which supplied and detected said hydrophobic oil to said cooling path may become high, and water may be frozen disappears When freezing of the water within the interior of a fuel cell and a liquid circulation path etc. can be prevented effectively certainly, it changes with sufficient timing to water, and the further remarkable effectiveness [say / that temperature of a fuel cell is made into efficient proper temperature, and can be maintained] is done so.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Water and a hydrophobic oil are the explanatory views explaining one embodiment of the polymer electrolyte fuel cell system of this invention stored in one storage tank.
[Drawing 2] It is an explanatory view explaining one embodiment of other polymer electrolyte fuel cell systems of this invention by which water and a hydrophobic oil are stored in the respectively different storage tank.
[Drawing 3] It is the decomposition sectional view showing the basic configuration of the cel unit of a polymer electrolyte fuel cell.
[Drawing 4] It is the sectional view showing the basic configuration of a polymer electrolyte fuel cell stack.
[Description of Notations]
1 Solid-state Polyelectrolyte Film
2 Air Pole Side Catalyst Bed
3 Fuel Electrode Side Catalyst Bed
4 Air Pole Side Gaseous Diffusion Layer
5 Fuel Electrode Side Gaseous Diffusion Layer
6 Air Pole
7 Fuel Electrode
8 Gas Passageway
9 Cooling Water Passage
10 Separator
11 Cel Unit
20, 20A, 20B Storage tank
21 22 Output port
23 24 Selector valve
25 Circulating Pump
26, 28, 28A, 28B Liquid circulation path
27 Fuel Cell
29 Control Unit
30 31 Heater
32 Fuel Gas Supply Way
33 Oxidant Gas Supply Way

[Translation done.]

* NOTICES *

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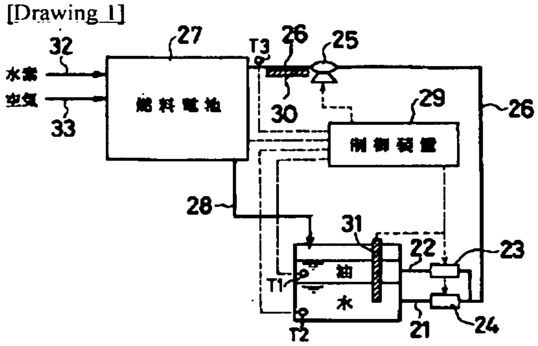
damages caused by the use of this translation.

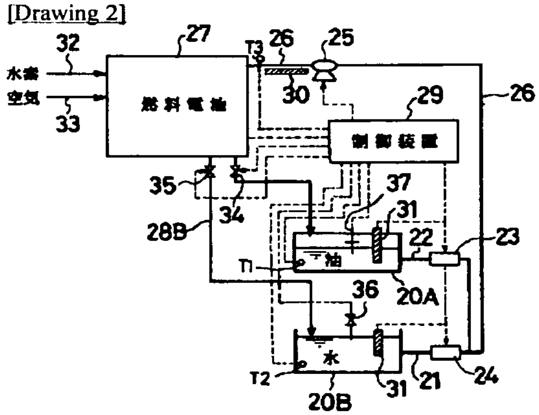
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

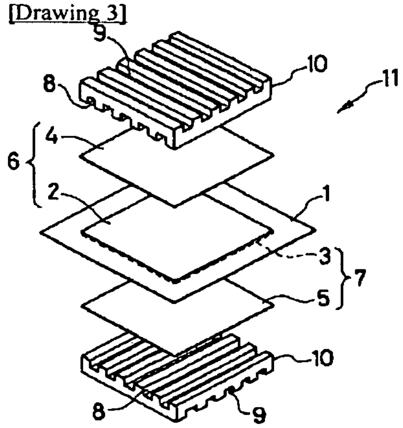
[Drawing 1]



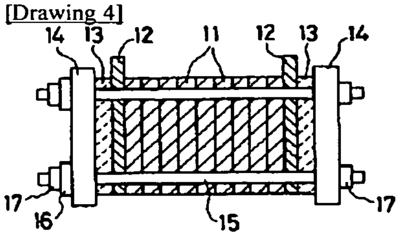
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]